

In the Claims

Please amend claims 1, 5, 6, 9 and 11-13 as follows and cancel claims 2-4 without prejudice or disclaimer to the subject matter contained therein. The current status for all of the claims is also provided.

1. (Currently Amended) An indirectly heated cathode ion source comprising:

an arc chamber housing defining an arc chamber having an extraction aperture;
an extraction electrode positioned outside of the arc chamber in front of the extraction aperture;

an indirectly heated cathode positioned within the arc chamber;

a filament for heating the cathode;

a filament power supply for providing current for heating the filament;

a bias power supply coupled between the filament and the cathode;

an arc power supply coupled between the cathode and the arc chamber housing;

an extraction power supply, coupled between the arc chamber housing and the extraction electrode, for extracting from the arc chamber an ion beam having a beam current; and

an ion source controller for controlling the beam current extracted from the arc chamber at or near a reference extraction current, said ion source controller comprises a feedback controller for controlling a bias current supplied by said bias power supply or a filament current supplied by said filament power supply in response to an error value based on the difference between a sensed beam current and the reference extraction current.

2. (Canceled) An ion source as defined in claim 1 wherein said ion source controller comprises feedback means for controlling the extracted beam current in response to an error value based on the difference between a sensed beam current and the reference extraction current.

3. (Canceled) An ion source as defined in claim 2 wherein said feedback means comprises means for controlling a bias current supplied by said bias power supply in response to the error value.

4. (Canceled) An ion source as defined in claim 2 wherein said feedback means comprises means for controlling a filament current supplied by said filament power supply in response to the error value.

5. (Currently Amended) An ion source as defined in claim ~~2~~1 further comprising an extraction current sensor for sensing an extraction power supply current that is representative of the extracted beam current.

6. (Currently Amended) An ion source as defined in claim ~~2~~1 wherein said feedback means comprises a Proportional-Integral-Derivative controller.

7. (Original) An ion source as defined in claim 1 further comprising:
a suppression electrode positioned between the arc chamber housing and the extraction electrode; and
a suppression power supply coupled between the suppression electrode and ground.

8. (Original) A method for controlling an indirectly heated cathode ion source comprising a cathode and a filament for heating the cathode, said method comprising the steps of:
sensing a beam current extracted from the ion source; and
controlling a bias current between the filament and the cathode in response to an error value based on the difference between the sensed beam current and a reference extraction current.

9. (Currently Amended) The method as defined in claim 8 further comprising the steps of:

maintaining a filament current at a constant value; and
maintaining an arc voltage at a constant value;
wherein a filament voltage and an arc current are unregulated.

10. (Original) A method for controlling an indirectly heated cathode ion source comprising a cathode and a filament for heating the cathode, said method comprising the steps of:

sensing a beam current extracted from the ion source; and
controlling a filament current through the filament in response to an error value based on the difference between the sensed beam current and a reference extraction current.

11. (Currently Amended) The method as defined in claim 10 further comprising the steps of:

maintaining a bias current at a constant value; and
maintaining an arc voltage at a constant value;
wherein a bias voltage and an arc current are unregulated.

12. (Currently Amended) A method for controlling an indirectly heated cathode ion source comprising a cathode and a filament for heating the cathode, said method comprising the steps of:

sensing a beam current extracted from the ion source; and
controlling the beam current extracted from the ion source by a bias current between the filament and the cathode or a filament current through the filament in response to an error value based on the difference between the sensed beam current and a reference extraction current.

13. (Currently Amended) A method for controlling a beam current extracted from an arc chamber comprising the steps of:

providing an arc chamber housing defining an arc chamber having an extraction aperture;

providing an extraction electrode positioned outside of the arc chamber in front of the extraction aperture;

providing an indirectly heated cathode positioned within the arc chamber;

providing a filament for heating the cathode;

providing a filament power supply for providing current for heating the filament;

providing a bias power supply coupled between the filament and the cathode;

providing an arc power supply coupled between the cathode and the arc chamber housing;

providing an extraction power supply, coupled between the arc chamber housing and the extraction electrode, for extracting from the arc chamber an ion beam having a beam current; and

providing an ion source controller for controlling the beam current extracted from the arc chamber at or near a desired level, in response to an extraction current supplied by the extraction power supply.